

Review of *Arenophilus* and Key to All Species^{1, 2}

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In presenting a new species of *Arenophilus* I have taken the opportunity of reviewing aspects of the genus, its important diagnostic criteria, its known species, its distribution, its relationships and categorical position, for since its inception it has for most students occupied a kind of systematic limbo. Chamberlin, who proposed *Arenophilus* and described three of its five species, contented himself only with species descriptions, and Attems in his ordinal monograph of 1929 (*vide infra*), relying upon a scanty and misleading literature alone, mislocated it within his system.

Arenophilus Chamberlin

Arenophilus Chamberlin, Bull. Mus. Comp. Zool. Harvard, 54, p. 416, 1912.
Zygomerium Chamberlin, Proc. Biol. Soc. Wash., 56, p. 100, 1943. (New Synonymy).⁴

Type-species: *Geophilus unaster* Chamberlin, 1909 [= *Arenophilus unaster* (Chamberlin)]. Original designation.

The tuberculate ultimate pretarsus, the incomplete pleurograms, and the abortive pleuroprosternal sutures will readily identify the genus within Geophilidae.

Generic Diagnosis. Cephalic plate at least 1.3 times longer than wide; transverse suture very indistinct. Antennae: long, at least 4 times longer than cephalic plate. Clypeus: without plagulae; with a single antero-central fenestra with inclusive setae. Labrum: Midpiece narrowly separating the sidepieces or overlapped by them, the latter with long hyaline filaments. First maxillae: with long telopodite and coxosternal lappets. Second maxillae: isthmus anteroposteriorly relatively deep, areolate, not sutured; telopodite first article notably shorter than the others, apical claw long, simple, both basal condyles present; statumina and parastatuminial sutures absent, post-maxillary sclerites absent. Prehensorial segment: prosternum with prominent virtually complete pleurograms; pleuroprosternal sutures strongly oblique, anteriorly terminating at less than half the distance to anterior margin. Sternites: deeply punctured, medially often fossulate; ventral porefields appearing in subcircular, longitudinally or transversely subelliptical configurations. Ultimate pedal segment: sternite broader than

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² Chilopoda, Geophilomorpha, Geophilidae.

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⁴ By original designation the type-species of *Zygomerium* is *Z. euphanum* Chamberlin, which in turn is conspecific with *Arenophilus watsingus* Chamberlin; accordingly, *Zygomerium* is a junior subjective synonym of *Arenophilus*. The original description of *euphanum*, whose holotype I have studied, is in error.

long; coxopleural pores opening into two subsurface cavities on each coxopleuron; pretarsus tuberculate; tarsalia two.

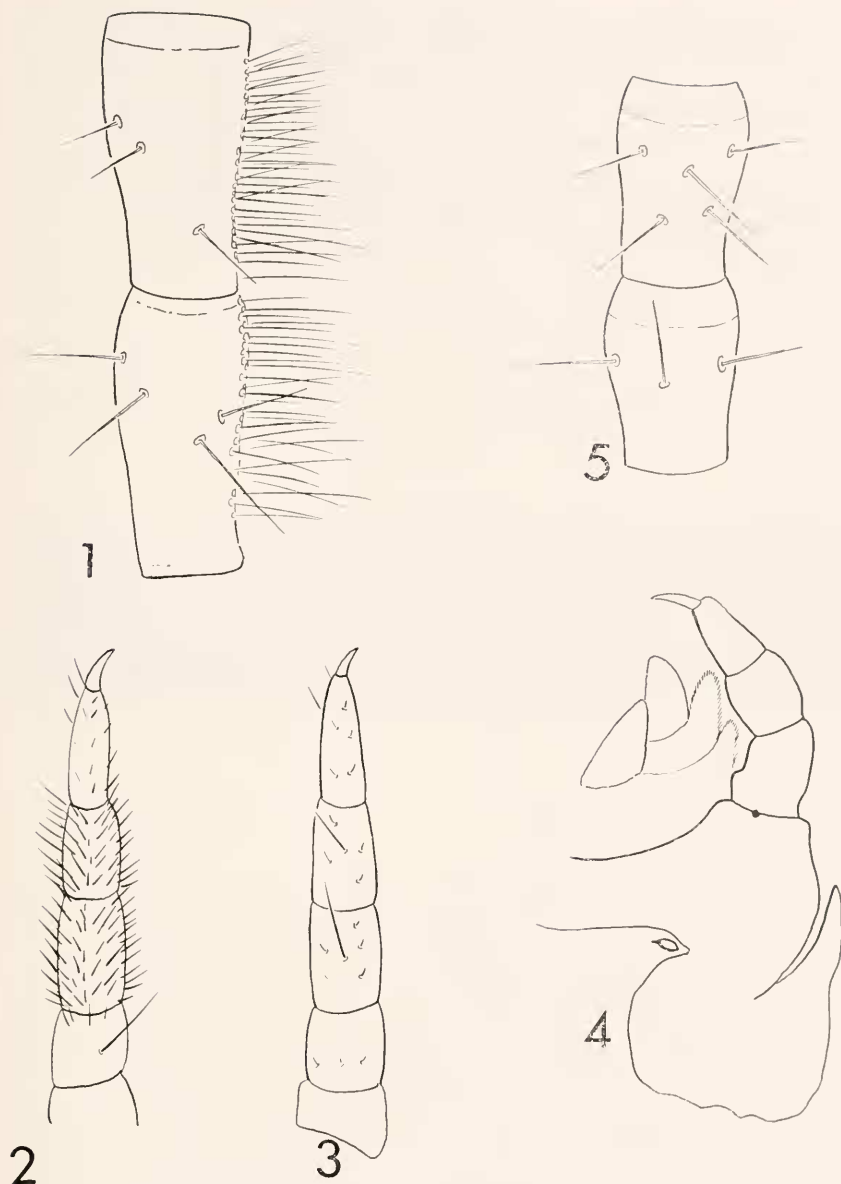
KEY TO KNOWN ARENOPHILUS SPECIES

1. Ventral porefields subelliptical to lanceolate, their long axes anteroposterior.....**unaster** (Chamberlin)
 Ventral porefields subtriangular to subcircular, their long axes transverse.....2
2. Ventral porefields subcircular, about as long as wide.....**watsingus** Chamberlin
 Ventral porefields subtriangular, much wider than long.....3
3. Prehensorial first article without mesodistal denticle.....**iugans** Chamberlin
 Prehensorial first article with mesodistal denticle.....4
4. Anterior legs ventrally very densely setose. Dorsum typically with a dark geminate band.....**bipuncticeps** (Wood)
 Anterior legs ventrally very sparsely setose. Dorsum without geminate dark band.....**psednus**, new species

Systematic Notes. This genus and the European *Necrophlocophagus* occupy a position intermediate between Geophilidae and Chilenophilidae,⁵ and their assignment to the one or the other poses a problem that is at once interesting and refractory. In *Arenophilus* the long, robust prehensors, the distinct fenestra, the nearly eclipsed labral midpiece, and the dolichocephalic head all suggest Chilenophilidae. On the other hand the oblique pleuroprosternal sutures, the prominent pleurograms and, very compellingly, the whole habitus of the first and second maxillae are more characteristic of Geophilidae. And hence the horns of the dilemma, for one can marshal convincing reasons for assigning the genus to each family. Tentatively I shall assign it to Geophilidae because it keys out handily to that family, but I must confess that I have the feeling that it is a chilenophilid masquerading as a geophilid.

All of the above features, particularly the abortive pleuroprosternal sutures, clearly indicate close kinship between *Arenophilus* and *Necrophlocophagus*, both occupying an annectant position between the aforementioned taxa.

⁵ Attems in various publications including his great ordinal monograph, *Das Tierreich*, Lief. 52, 1929, erroneously located the, to him unknown, *Arenophilus* within Geophilinae, p. 158, even though if one uses its true characteristics in conjunction with his key to subfamilies, p. 157, it would plainly key out to Pachymeriinae. Of course, never having seen a specimen by 1929, he was misled by descriptions and lacunae in the literature. In the present discussion I do not follow Attems' division of Geophilidae into Pachymeriinae and Chilenophilinae, but instead am in accord with Chamberlin's view that sees in the latter two subfamilies a single family, Chilenophilidae, which is distinct from Geophilidae.



FIGURES 1-5; *Arcnophilus bipuncticeps* (Wood): 1, 2. *A. psednus*, holotype; 3, 4, 5. FIG. 1. Antennal articles 3 and 4; left ventral. All setae shown. FIG. 2. Left fifth leg; ventral. All setae shown. FIG. 3. Left fifth leg; ventral. All setae shown. FIG. 4. First and second maxillae; left side, ventral. Setae deleted. FIG. 5. Antennal articles 3 and 4; left ventral. All setae shown.

So far as is known, *Arenophilus* occurs only in extreme northern Mexico and in all but the most northern of the United States. Its two most widespread species are *bipuncticeps* (Wood) and *waatsingus* Chamberlin, which throughout their range tend to replace the species of *Geophilus*. Of all North American geophilids *bipuncticeps* appears to be the most widespread and, within its range, the most prevalent. It is possible, however, that some records attributed to the Wood species were actually based upon very similar but different species, such as the new one described below.

Arenophilus psednus, NEW SPECIES

The new species most closely resembles *bipuncticeps* (Wood) but differs from it most conspicuously as follows. In *bipuncticeps*: (1) antennal articles each very long; width of each uniform; ectally with dense, long setae. (2) Anterior legs ventrally very densely setose. (3) Telopodite lappets longer than telopodites. (4) Dorsal geminate band present, dark. (5) Ultimate pretarsal tubercle typically short and hyaline. In *psednus*: (1) antennal articles each shorter; in each greatest width at distal end; ectally, sparsely setose. (3) Telopodite lappets shorter than telopodites. (4) Dorsum without geminate dark band. (5) Ultimate pretarsal tubercle longer, fulvous.

Holotype: female. Kentucky, Boyle County, Lawrence Cave at the southwest edge of Perryville. June 23, 1967; T. C. Barr, Jr., leg.

GENERAL. Length, 45 mm. Leg pairs, 59. Shape: anteriorly slightly, gradually attenuate; ultimate ten segments strongly attenuate. Color: brownish yellow, without dorsal midlongitudinal geminate band.

ANTENNAE. Length to head length, 4:1. Each article except first longer than wide; article 2 slightly geniculate. Vestiture: articles 1-5 each with 1-2 circlets of setae; articles 6-14 each with many circlets of shorter setae; in general setae of the more distal articles shorter and more numerous. CEPHALIC PLATE. Length to width, 12:10. Cephalic suture weakly indicated. With two paramedian sutures. Sides slightly excurved; rear straight. CLYPEUS. Wider than greatest length. Antero-centrally with a prominent white clypeal fenestra with two stout inclusive setae. Remaining setae minute, sparse. Plagulae absent. Paraclypeal sutures strong, complete. LABRUM. Midpiece very narrowly separating sidepieces. Each fulcrum short, robust, transverse, about $\frac{1}{3}$ as long as one sidepiece. FIRST MAXILLAE. Telopodites: biarticular; lappets robust, distally blunt, shorter than telopodite. Coxosternal lappets reaching half the height of the telopodite lappets. SECOND MAXILLAE. Basal article of first article with an inner protuberance; claw long and curved.

PREHENSORS. Trochanteroprefemur with low, weakly pigmented denticle; claw with basal denticle. Tarsungula: blade smooth, not serrate. PROSTERNUM. Pleurograms prominent, essentially complete to the condyles. Pleuroprosternal sutures oblique, incomplete, terminating laterally at a point half distant to anterior margin.

TERGITES. Sparsely, shortly setose. Subsurface dark geminate band absent. STERNITES. Without *carpopagus*-structures; on anterior body third each with a

slight anterocentral fovea. Porefields: single on 1-19, broadly transverse, weakly triangular, the very obtuse apex posterior, without anterior extension; 20 through penult each double, each subelliptic to subcircular. Intersternites of anterior body half medially weakly divided, the division not apparent on posterior body half. LEGS. Vestiture very sparse, not dense as in *bipuncticeps*. Tibiae and femora of all legs ventrally with a single exceptionally long seta.

ULTIMATE PEDAL SEGMENT. Pretergite laterally not fissate, fused with its pleurites. Tergite: greatest width to length, 13:10. Presternite anteroposteriorly deep, without midlongitudinal suture or division. Sternite: much wider than greatest length, 9:6. Rear margin very slightly embayed; sides on anterior half parallel, on posterior half slightly convergent. Coxopleuron: with two heterogeneous glandular cavities, their walls convoluted and minutely papillate. Telopodite: notably longer than penult, not crassate. Distotarsus longer than proximotarsus, 6:5. Pretarsus tuberculate, pigmented, hispidate.

POSTPEDAL SEGMENTS. Female gonopods medially fused without suture or division, unarticulate. Anal pores large heterogeneous, walls convoluted and minutely papillate.

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ECOLOGY OF APHIDOPHAGOUS INSECTS

Edited by IVO HODEK and M. L. DUTKOWA. 1966. Dr. W. Junk, Publishers, The Hague, The Netherlands, 360 pp. + 10 plates. Cloth, approx. \$14.00.

The proceedings of a symposium held September 27 to October 1, 1966, in Liblic (Near Prague), Czechoslovakia, are presented as summaries of the 75 papers given during the 5-day meeting, participated in by 86 research workers from many countries. The papers are grouped into 6 sections: I. food ecology of aphidophagous insects, 17; II. voltinism and arrest of development in aphidophagous insects, 4; III. behavior of aphidophagous insects and aphids, 14; IV. distribution of aphidophagous insects in habitats, 13; V. population dynamics of aphids and their natural enemies, 17; and VI. aphidophagous insects in biological and integrated control, 10. The first paper of each section is a review of previously published information, and the closing paper of each (except II which had none) summarizes the papers presented with a general discussion of them in an attempt to compensate for their subjective approaches.

This book contains a wealth of basic background information for entomologists, especially those interested in or concerned with biological control of aphids. It will be an essential working tool for those in research with aphids as well as for teachers and students of entomology, both at the graduate and undergraduate levels. However, one may differ with the scientific editor's conclusions that "The conception, working methods and conclusions," contained in the summarized papers, "are valid not only for predators and parasites of aphids, but also for natural enemies generally." Nevertheless,